

REMARKS

The claims have been amended to better define the claimed invention and better distinguish the invention from the prior art. More particularly, independent claims 1 and 66 have been amended to clarify that the anode is formed of a titanium suboxide/carbon composite. This clearly distinguishes the claimed invention from the primary reference Dean et al. who teaches the use of anodes that are primarily metallic titanium, with oxygen present only as a minor impurity and containing no carbon.

In the rejection, the Examiner refers to the material melted to make the anode in Dean's Example No. 1 as being rutile. In actuality, that material was the product of multiple preceding steps that started with rutile and extracted most of its oxygen to convert it to crude Ti metal. Dean et al. gives the chemical analysis of the material to be melted as 87% Ti and 10% Cu with the balance comprising oxygen and incidental impurities (col. 4, lines 55-56). That leaves only 3% of the melted material, at most, that could have been oxygen. Rutile (TiO_2) has an oxygen to titanium molar ratio of 2.0 while the material melted to make the anode in Dean's Example No. 1 could at most have a molar ratio of 0.103. Further, the anode of that example does not fit the description of titanium suboxide since the lowest molar ratio of oxygen to titanium in a suboxide of titanium that can be produced by reducing titanium oxides with carbon is 1.0, ten times the molar ratio of the material taught by Dean, calculated from Dean's elemental analysis.

Neither secondary reference Cass used to reject claims 1, 11, 54, 60, 66, 76, 85, 89-92 and 93-95, and Cass and Rand used in the rejection of claims 12, 55, 61 and 77 does not supply

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the missing teachings to Dean et al. to achieve or render obvious any of Applicants' independent claims 1, 54, 60 or 66 which all require a titanium suboxide and carbon composite.

In rejecting the claims as obvious from Dean et al. and Cass, the Examiner, in the first full paragraph on page 4 of the Action takes the position that it would be obvious to one skilled in the art that contacting rutile (titanium oxide) with carbon at an elevated temperature in a non-oxidizing atmosphere as disclosed by Dean et al. would result in the formation of titanium suboxide as disclosed by Cass "because Cass...teaches a substantially similar process (titanium oxide contacting carbon in a non-oxidizing atmosphere at an elevated temperature) effecting the formation of titanium suboxide and an electrically conducted article" (referring to Cass, col. 2, lines 35-51 and col. 9, lines 7-42). Even assuming *arguendo* Cass is as the Examiner describes, Cass doesn't form a titanium suboxide/carbon composite since Cass teaches that the graphite is consumed during the reaction with the metal oxide being chemically incorporated into the titanium suboxide (col. 9, lines 26-30). Thus, none of Applicants' independent claims 1, 54, 60 and 66 can be said to be obvious from a combination of Dean et al. and Cass, since no combination of Dean et al. and Cass reasonably could be said to achieve or render obvious claims 1, 54, 60 and 66.

With regards specifically to the Examiner's rejection of claims 11 and 76 based on Dean's alleged use of aqueous hydrochloric acid to leach the titanium product from his electrochemical cell, it is submitted that hydrochloric acid as taught by Dean is not a molten salt electrolyte as required by Applicants' claims 11 and 76. Thus, claims 11 and 76 are also allowable over Dean et al. and Cass.

Turning to the rejection of claims 12, 55, 61 and 77, as obvious from Dean et al. in view of Cass and further in view of Rand, the Examiner refers to Rand as teaching a molten salt

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electrolyte. Even assuming arguendo, Rand is as the Examiner states, it is submitted the applied prior art still would not achieve the claimed invention. As noted supra, Dean teaches dilute hydrochloric acid to leach titanium from the cathode. Dilute hydrochloric acid is not a molten salt electrolyte as required by claim 11 or claim 54 or claim 60 or claim 76 or claims 12, 55, 61 and 77, which depend, respectively thereon. Thus, no combination of Dean et al., Cass and Rand reasonably could be said to achieve or render obvious any of claims 12, 55, 61 and 77.

New claims 110-119 are also allowable over the combination of Dean et al., Cass and Rand for the same reasons above adduced relative to claims 12, 55, 61 and 77, as well as for their own additional limitations.

Turning to the rejection of claims 54, 55, 58-61 and 64-65, as obvious from Slatin in view of Kroll and further in view of Cass, independent claims 54 and 60 specify anodes made from a composite of titanium suboxide and carbon. As noted in Amendment A, incorporated herein by reference, Slatin's anode is formed of titanium carbide (see col. 1, lines 47-57 and Example 4, col. 4 beginning at line 11). Slatin teaches forming an anode formed of titanium carbide by using that anode in an electrochemical cell to produce titanium. This is quite different from Applicants' independent claims 54 and 60 which require electrochemical reduction of an anode formed of titanium oxide-carbon composite, more specifically a titanium suboxide/carbon composite.

Neither secondary reference alone, or in combination supply the missing teachings to Slatin to achieve or render obvious any of Applicants' claims. The Examiner refers to Kroll as teaching production of titanium in the absence of nitrogen and oxygen. However, Kroll is a

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chemical reaction rather than an electrochemical reaction. Thus, Kroll is dealing with very different conditions and reactions.

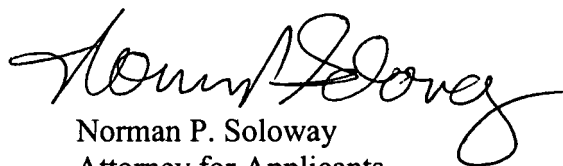
The deficiencies of Cass are discussed above. Accordingly, it is submitted that no combination of Slatin, Kroll, and Cass reasonably could be said to achieve or render obvious claim 54 or 60 or any of the claims 55, 58, 59, 61, 64 and 65 which depend directly on indirectly thereon.

Having dealt with all the rejections raised by the Examiner, it is believed that the Application now is in order for allowance.

Enclosed is Form PTO-2038 in the amount of \$200.00 to cover the cost of the additional claims.

In the event there are any fee deficiencies or additional fees are payable, please charge them (or credit any overpayment) to our Deposit Account Number 08-1391.

Respectfully submitted,


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